Space Weather Forecast

Issued on Monday, 18 December 2023 at 12:08 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Risk of G1 Minor Geomagnetic Storm until midweek UTC. Risk of further R1 Minor Radio Blackouts and S1 Minor Solar Radiation Storms reducing.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity is Moderate with occasional Common-class flares and a Moderate flare peaking at 17/2017UTC from the departing large and complex sunspot region that has dominated the past week. This is the same group that had delivered the largest flare of solar cycle 25 so far in the form of a Strong flare last week. Nine sunspot regions cover the facing side, although these are mostly small, stable and magnetically unipolar.
A 'filament eruption' (arc of plasma leaving the Sun) was observed on the far northeast at 17/1700UTC and significant Earth impacts are considered unlikely There were numerous other Coronal Mass Ejections (CMEs) visible on imagery, however these were not considered to carry Earth-directed components. No new Earth-directed CMEs were therefore in evidence.

Solar Wind / Geomagnetic Activity: The solar wind was elevated to start the period reducing to slightly elevated into the UTC evening. The number of particles associated with the solar wind was above average. The associated magnetic field displayed significant variability .The net result of the above solar wind measures was for provisionally quiet to G2 Moderate Geomagnetic Storm conditions, peaking in the 06-09UTC interval, while the magnetic field was most strongly anti-aligned with Earth's.

Energetic Particles / Solar Radiation: Proton flux continued to trend back to resting background levels, having been raised in response to the recent larger flares from AR3514. It was below the S1/Minor Radiation Storm threshold throughout the last 24 hours, with an early peak of 1.8pfu (S1 starts at 10pfu).

Four-Day Space Weather Forecast Summary

Solar Activity: There remains a chance of an isolated Moderate class flare. Some further active regions are likely over the eastern solar horizon into the new UTC working week to maintain the risk.

Solar Wind / Geomagnetic Activity: There is now one further weak possible CME in the forecast, with arrival mooted for the very end of 19 or early on 20 December. The other component of the forecast, a persistent 'coronal hole' fast wind, is more assured, and is due on 19 December. Geomagnetic activity carries a tail of risk of further G1 Minor Geomagnetic Storms through the remainder of Monday 18 December, falling to quiet into early Tuesday. Later that UTC day, there is a possibility of a coronal hole fast wind arriving and perhaps very late departure on the 15 December CME, with the effects of these perhaps combining to give a peak chance of G1 before this again wanes through midweek to leave a probable quiet end to the four-day forecast.

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Energetic Particles / Solar Radiation: Proton flux is now just very slightly above background, with a slight chance of exceeding S1 again should the departing main large sunspot flare appropriately. This probability should then wane as this sunspot group progressively rotates from a potent position and further onto the far side.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	40	40	20	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	30	30	20	20
Very Active	R3 to R5 X	No	5	5	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	15	10	10	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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